

Title: Inching into Fractions

Brief Overview:

Students will be introduced to fractions as they analyze, compare, manipulate and create fractions using concrete materials, symbols and drawings.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

- **Number and Operations**

- *Understand the meaning of fractions through various representations, using concrete materials, symbols and drawings.*
 - *Use problem solving, mathematical communication, and reasoning to compare and order the numerical value of two fractions.*

- **Measurement**

- *Use the opportunity to use a nonstandard unit of measurement to measure fractional parts.*

- **Process Standards**

- **Problem Solving**

- *Apply various strategies to solve problems involving fractions.*

Reasoning and Proof

- *Demonstrate the mathematical ability by ordering and comparing fractions.*

Communication

- *Demonstrate the ability to communicate using fractional terms.*
- *Communicate orally, written numerically, and through visual representations.*

Connections

- *Recognize and apply mathematical strategies to real-life situations.*

Representation

- *Create and use various ways to represent fractions (orally, numerically, and through visual representations).*

Links to Virginia Math Standards of Learning:

(The number preceding the objective indicates grade level and standard.)

Probability and Statistics

3.5

The student will name and write the fractions represented by drawings or concrete materials and represent a given fraction, using concrete materials and symbols.

3.6

The student will compare the numerical value of two fractions having like and unlike denominators, using concrete materials.

Grade/Level:

Grade 3

Duration/Length:

Three days/45 minute sessions

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Integers
- Sequencing
- Measurement using nonstandard units
- Cooperative learning
- Concepts of greater than, less than, equal to

Student Outcomes:

Students will:

- describe fractions as equal parts of a whole.
- use concrete materials and drawings to represent a fractional part of a whole.
- name and write fractions represented by concrete materials and drawings.
- compare the numerical value of two fractions.
- identify and represent equivalent fractions using concrete materials.

Materials/Resources/Printed Materials:

- Student Resource Sheets #1-3
- Teacher Resource Sheets #1-4
- Inchworm and a Half by Elinor J. Pinczes
- Cuisenaire rods
- Student journals and pencils
- Overhead projector and markers
- Chart paper
- Magic markers
- Fraction circles, fraction tiles, fraction squares, etc.
- Gummy worms
- Scissors
- Geoboards and bands
- Pipe cleaners

Development/Procedures:

Day 1

- Copy, cut, and post the worms from **Teacher Resource Sheet 1**.
- Using **Teacher Resource Sheet 1**, allow class discussion to describe and compare the relationships between the different lengths of the worms. Record student responses onto chart paper.
- Read Inchworm and a Half by Elinor J. Pinczes.
- Distribute Cuisenaire Rods to cooperative groups.
- Using the orange rod as one whole unit, instruct students to find other colors of rods which will equal its length.

1 orange = 2 yellows
 = 5 reds
 = 10 whites

Continue exploration using the blue rod as one whole unit.

1 blue = 3 light greens
 = 9 whites

Now use one orange plus one red as one whole unit.

1 orange + 1 red = 2 dark greens
= 3 purples
= 4 light greens
= 6 reds
= 12 whites

Use the brown rod as one whole unit.

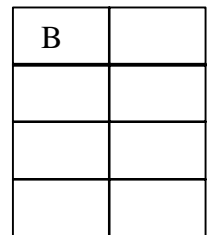
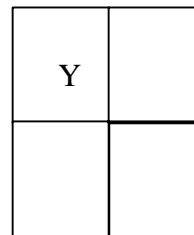
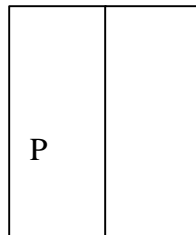
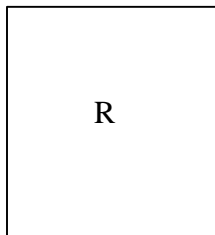
1 brown = 2 purples
= 8 whites

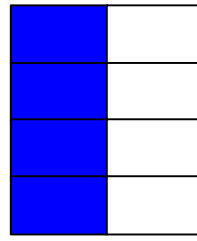
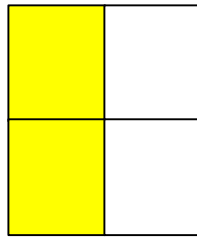
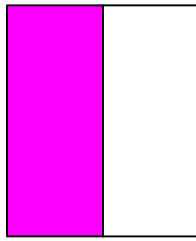
During exploration, discuss the numerical representation of each fractional part.
(Example – $\frac{1}{3}$)

- Complete **Student Resource 1**. See **Teacher Resource 5** for answers.
- Students will write in a journal to explain the meaning of fractions and will give examples using vocabulary, drawings, or numerical representations.

Day 2

- Review Day 1 activities by discussing journal entries and use fraction bars, fraction circles, fraction squares, etc.
- Using the overhead projector, place the one-half fraction piece on the overhead next to a whole fraction piece. Allow children to reveal it would take two of the one-half pieces to equal one of the whole pieces. Write and draw the fraction one-half on chart paper (which is hanging up in the front of the room). Place the whole unit manipulative on top, leaving the one-half piece below.
- Now place two one-fourth fraction pieces beside the one-half piece. Move one of the one-fourth pieces up next to the whole piece. Compare by adding on one-fourth pieces until you cover up the whole. Discuss that it would take four of these to make one whole. Draw and write the numerical fraction on the chart paper. Move the one-half fraction piece up, so that it stays just below the whole.
- Finally, place two one-eighth fraction pieces beside the one-fourth piece. Once again, discuss that it would take two of these one-eighth pieces to equal the one-fourth piece. Move the one-eighth up to the one-half piece to show that it would take four to cover up; therefore, each eighth is one-fourth of the one-half piece. Write and draw these fractions on the chart paper. Then, move the one-eighth up to the whole and display that it would take eight of these to cover up the whole. This means that each of these is one-eighth of the whole piece. Record fractions onto chart paper. When finished, display equivalent fractions by looking at the finished chart:





$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$$

*R=red
P=pink
Y=yellow
B=blue

- Cut **Teacher Resource 2** into cards and have students work in pairs to play “Worm Catch”. Shuffle cards and deal the cards between both players. Each player turns over his/her top card, using rainbow fraction tiles to represent the fraction showing on the card. The player catching the longest worm (the largest fraction) collects both cards. Play continues until all cards have been played.
- Students will write in their journals to demonstrate their knowledge of comparing fractions. They will choose two fractions, and explain how they are alike or different. The students must use the terms greater than, less than, or equal to and display visual representations of the two fractions.

Day 3

- Review journal entries from previous day, allowing students to share the two fractions they compared.
- Distribute geoboards and geobands among students. Children work in pairs to review fractional parts. One student will call out a fraction, while the other student shows the representation on the geoboard. Partners continue taking turns calling out fractions.
- Complete **Student Resource 2**. This is a treasure hunt game, so the gummy worms should be placed on top of the teacher’s desk before the students arrive in class.

Performance Assessment:

The students will create fractional representations using pipe cleaners. They also will use appropriate math language to describe how the pieces compare to each other. Students are also responsible for ordering the fractions from greatest to least. Students complete **Student Resource 3**. **Teacher Resources 3 and 4** contain the rubric for assessment.

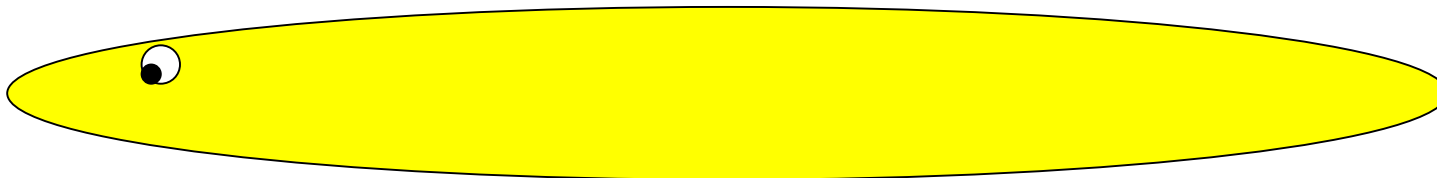
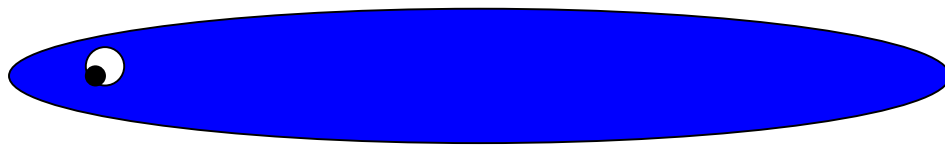
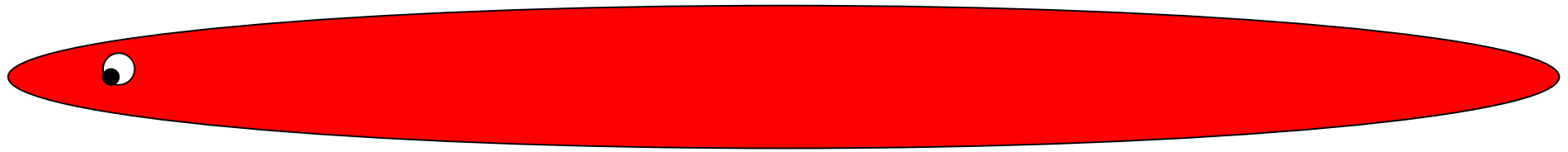
Extension/Follow Up:**Math Activities**

- Use fractional concepts to introduce measurement.
- Use other nonstandard units (links, for example) to compare and order fractions.
- Equivalent fractions

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Worm Catch

$1/2$	$4/5$	$3/4$	$7/8$	$2/3$
$1/10$	$8/12$	$5/6$	$2/5$	$3/8$
$5/12$	$5/6$	$2/5$	$3/8$	$5/12$
$3/10$	$2/6$	$1/3$	$2/10$	$2/6$

Worm Design Rubric

3- Pipe cleaners should be cut into equivalent fractions.

- Student's explanation of comparing fractions should be written clearly using appropriate math language.
- All fractional parts should be ordered and labeled correctly, from greatest to least.

2- Pipe cleaners should be cut into equivalent fractions.

- Explanation uses correct descriptions of comparing fractions, but does not use appropriate math language.
- All fractional parts should be ordered and labeled correctly, from greatest to least.

1- Pipe cleaners are not cut to represent all fractional pieces.

- Explanation of comparing fractions was poor, with no usage of math language.
- The fractional pieces were ordered incorrectly.

0- No attempt to design worm toys or to write an explanation.

Teacher Resource 4

Student Name _____

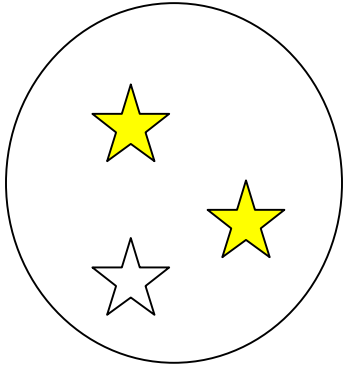
Rubric

Student Ability	3	2	1	0
Communicates Knowledge of Fractional Concepts	All Fractional Pieces are Represented	Some Fractional Pieces are Represented	Few Fractional Pieces are Represented	No Fractional Pieces are Represented
Appropriate Usage of Math Language	Always Uses Appropriate Math Language	Sometimes Uses Appropriate Math Language	Rarely Uses Appropriate Math Language	Never Uses Appropriate Math Language
Ability to Order and Compare Fractional Pieces	Orders and Compares all Fractional Pieces Correctly	Orders and Compares Some Fractional Pieces Correctly	Orders and Compares Few Fractional Pieces Correctly	Orders and Compares No Fractional Pieces Correctly

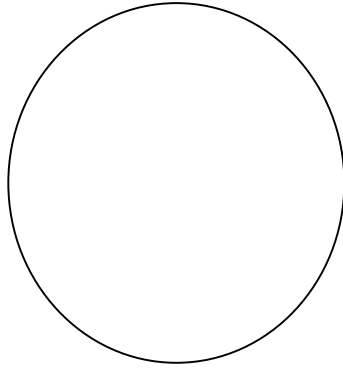
Total Score _____

Teacher Resource 5

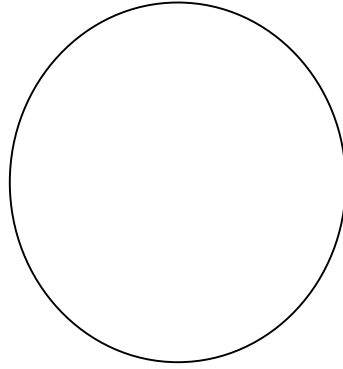
Show the fraction named. Arrange the eight fractions from greatest to least.
(Answers will vary.)



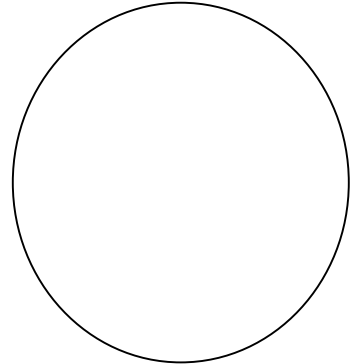
$\frac{2}{3}$



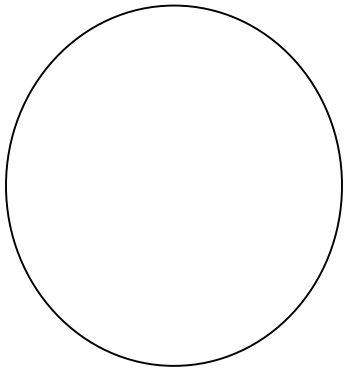
$\frac{5}{12}$



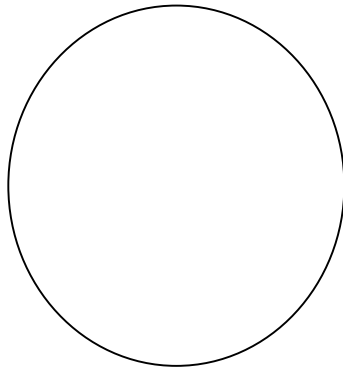
$\frac{7}{8}$



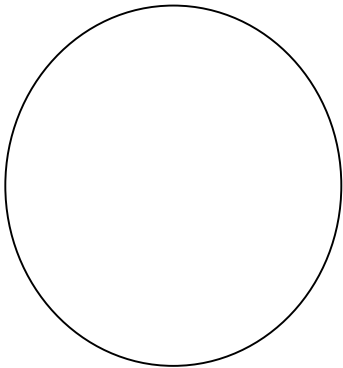
$\frac{1}{4}$



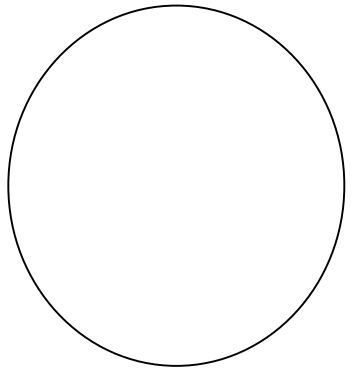
$\frac{5}{6}$



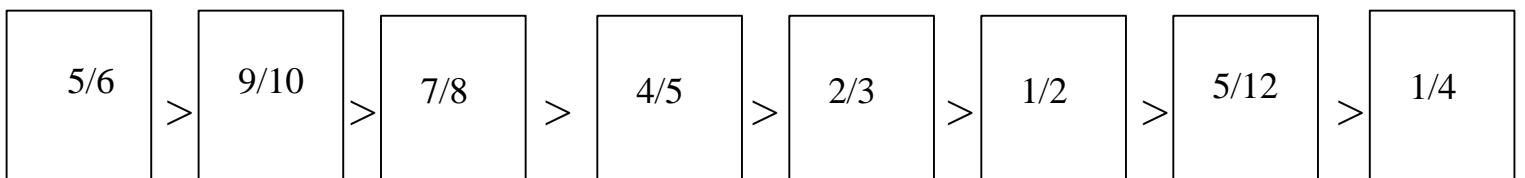
$\frac{9}{10}$



$\frac{1}{2}$



$\frac{4}{5}$



Treasure Hunt

Find the answers to the following problems to get clues for finding a treasure:

Last $\frac{3}{4}$ of HARE ___are___

First $\frac{1}{2}$ of YOU'RE ___you___

Last $\frac{2}{3}$ of CUP ___up___

First $\frac{3}{6}$ of FOREST ___for___

Middle $\frac{3}{5}$ of FLOOR
Last $\frac{4}{6}$ of BAKING > ___looking___

First $\frac{3}{7}$ of FORMING ___for___

First $\frac{2}{5}$ of WORLD
Last $\frac{3}{5}$ of TERMS > ___worms___

Last $\frac{2}{5}$ of FIRST > ___stop___

First $\frac{1}{2}$ of OPEN > ___prize___

Middle $\frac{1}{3}$ of EAR ___a___

First $\frac{2}{6}$ of PRETTY > ___prize___

Last $\frac{3}{4}$ of SIZE > ___prize___

Last $\frac{2}{3}$ of HIS ___is___

First $\frac{2}{4}$ of ONLY ___on___

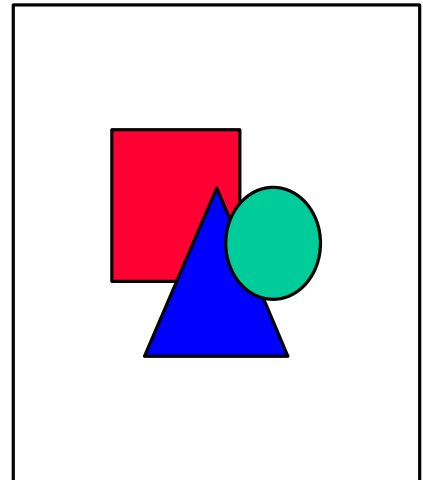
First $\frac{3}{4}$ of THEN ___the___

First $\frac{3}{6}$ of TEACUP > ___teachers___

Last $\frac{5}{9}$ of BLEACHERS

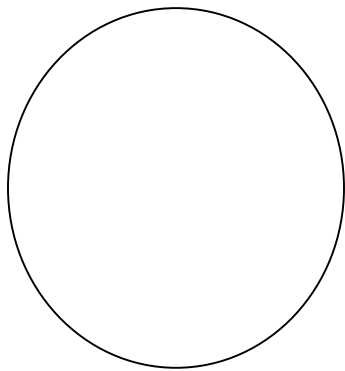
First $\frac{2}{3}$ of DEN > ___desk___

Last $\frac{2}{4}$ of MASK

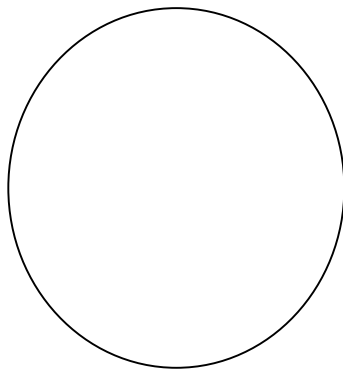


Student Resource 1

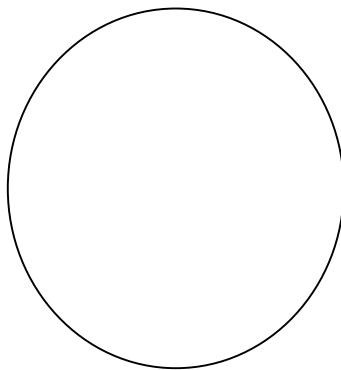
Show the fraction named. Arrange the eight fractions from least to greatest.



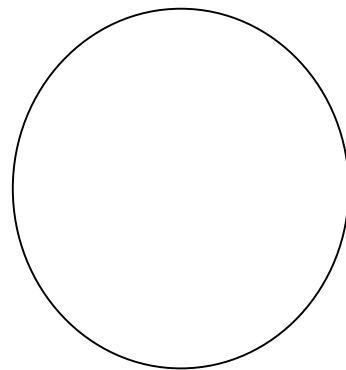
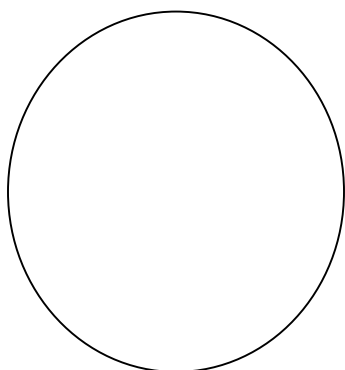
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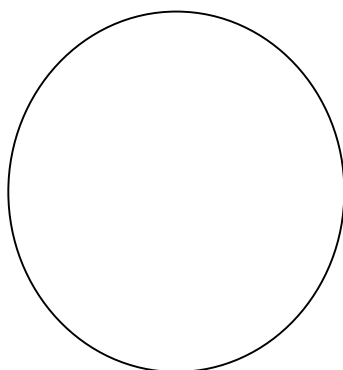
5/12



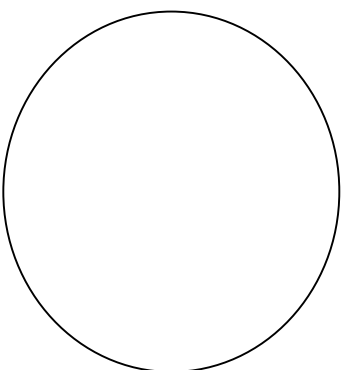
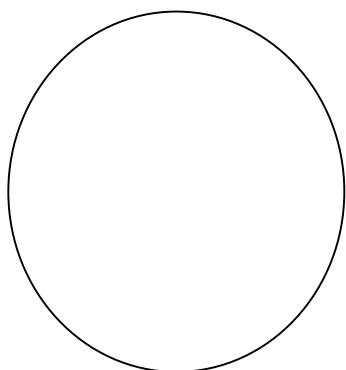
7/8

 $1/4$ 

5/6



9/10

 $1/2$ 

4/5

Treasure Hunt

Find the answers to the following problems to get clues for finding a treasure:

Last $\frac{3}{4}$ of HARE _____

First $\frac{1}{2}$ of YOU'RE _____

Last $\frac{2}{3}$ of CUP _____

First $\frac{3}{6}$ of FOREST _____

Middle $\frac{3}{5}$ of FLOOR _____

Last $\frac{4}{6}$ of BAKING _____

First $\frac{3}{7}$ of FORMING _____

First $\frac{2}{5}$ of WORLD _____

Last $\frac{3}{5}$ of TERMS _____

Last $\frac{2}{5}$ of FIRST _____

First $\frac{1}{2}$ of OPEN _____

Middle $\frac{1}{3}$ of EAR _____

First $\frac{2}{6}$ of PRETTY _____

Last $\frac{3}{4}$ of SIZE _____

Last $\frac{2}{3}$ of HIS _____

First $\frac{2}{4}$ of ONLY _____

First $\frac{3}{4}$ of THEN _____

First $\frac{3}{6}$ of TEACUP _____

Last $\frac{5}{9}$ of BLEACHERS _____

First $\frac{2}{3}$ of DEN _____

Last $\frac{2}{4}$ of MASK _____

Worm Designs

Worm Toys Inc. has developed a new game called Wormland. The students in your class have been selected to design the worms for the game using various sizes. This is a contest. It is important that you follow the directions. Using pipe cleaners create a worm representing one whole unit and the following fractions: half, thirds, fourths, sixths, eighths, and tenths.

Place your Wormland Worms in the Worm Toys Inc. shipping box, ordered from greatest to least. Label your fractional worms.

The diagram shows a rectangular shipping box with a 3D perspective. The front face is a rectangle divided into six equal horizontal compartments by five horizontal lines. The top and bottom edges of the box are slightly angled to create a perspective effect, with lines connecting the corners of the front face to the corners of the back face.

Write a letter to Worm Toy Inc. explaining how you determined the size of your worm.

